Detroit Engineered products (DEP), is an engineering services, product development, software development, consulting and talent acquisition company. Since its inception in 1998 in Troy, USA, DEP is now a global company with footprints in Europe, China, Korea, Japan, and India. DEP uses the accelerated and transformed product development process, accomplished by utilizing our proprietary platform, DEP MeshWorks, which rapidly reduces the development time of products for all industry segments. DEP MeshWorks, has focused set of solutions for electric vehicle development too - both on the propulsion side, and the vehicle body structure side.

We have developed a module specifically for Electric Vehicles in MeshWorks, called eMOD, which is a collection of specialized tools for modeling all components of an electric vehicle, which may be used for everything from system analysis to component analysis for EVs. It contains a set of structural and CFD modelling tools, for battery, power electronics, and electric drive unit models, and whole vehicle models as well as a BIW design and development tool. The toolkit runs several analysis and workflows, specifically customized to electric vehicle applications, which gives the customer tremendous value in fast modeling of electrification components, as well as in running complete simulations or workflows. Since the tool comes pre-packaged with workflows, the customer can save a lot of time spent in learning and research.

We do have specialized meshing tools for battery, EDU and inverters, with specific assembly and connection tools. The workflows in eMOD are really detailed. For instance, a battery itself can have about 30 workflows, and each analysis workflow needs to be executed in order to certify whether the battery will work in the intended way or not. The tools not only create the models, but also make them parametric. Additionally, it takes into account the stack-up effects between the different components, and automatically adjusts to it.

DEP

Smarter solutions. Realized.

EMOD-DIGITAL TWIN FOR ELECTRIC VEHICLE

Advantages of our Electrification module:

Rapid Meshing & Model Assembly

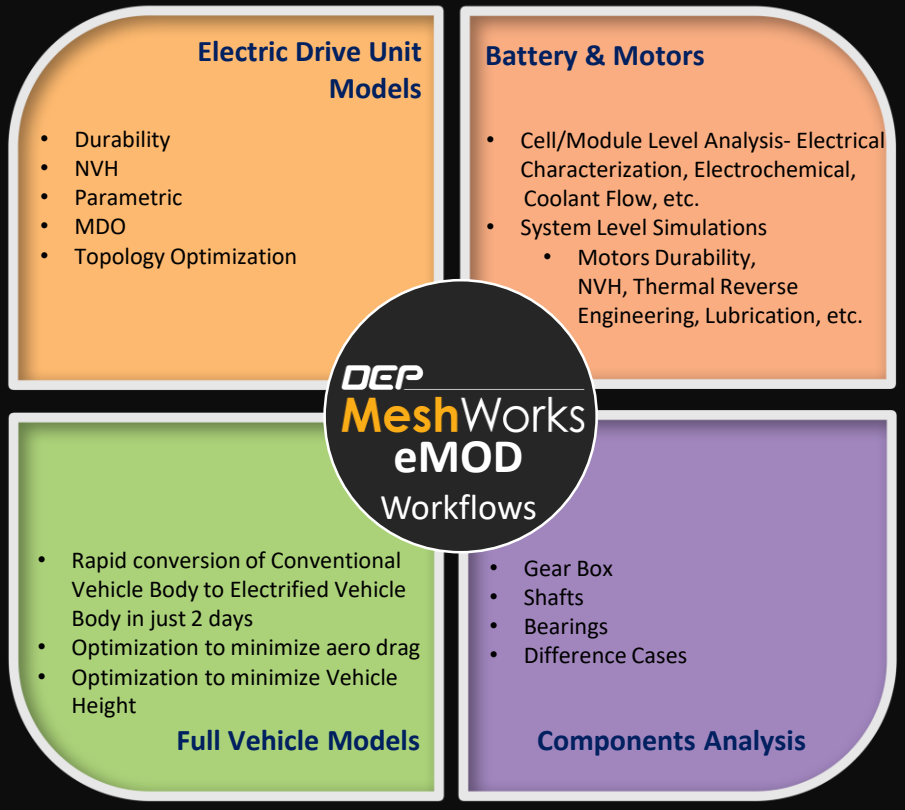
Faster and easier way to model components using the unique set of attributes designed for each analysis. This saves time and improves overall efficiency by avoiding the 'from-scratch' approach & removing dependency on CAD.

Pre-defined Workflows

Workflow sets for EV analysis can eliminate 'learning' time by guiding the user step by step throughout the process and across multiple tools. These process automation can also customized & made tailor-fit for specific analysis needs of the user thus achieving functional efficiency.

Parametrization & Optimization

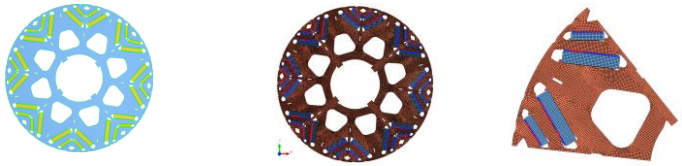
Specialized functions for each components helps create detailed models easily with minimum efforts. The created models can then be altered & iterated to achieve best results at rapid pace. The MeshWorks eMOD functions allows users to optimize the designs based on DoE studies. Since the model is parametric, these changes can be done at lightening speed.



MeshWorks eMOD Architecture

Comprehensive Structural & CFD Modeling

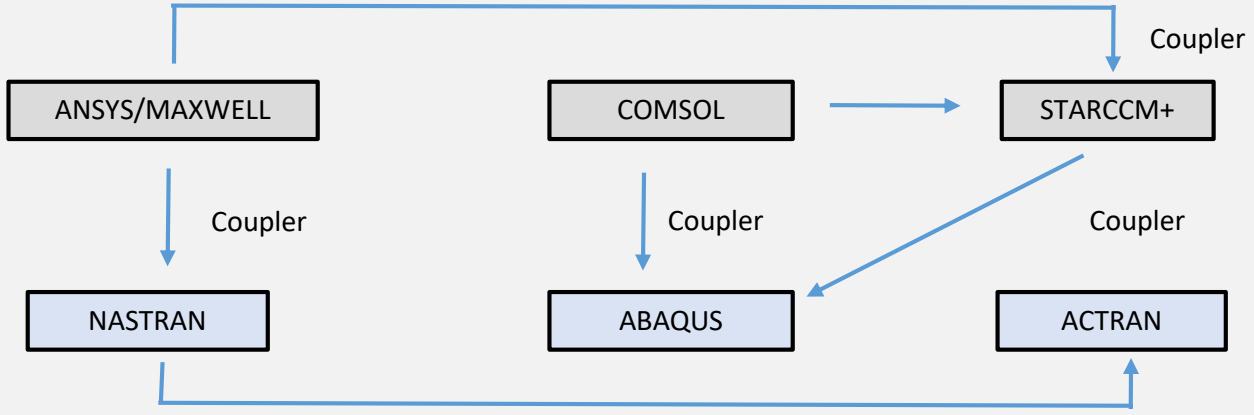
- Battery Meshing & Assembly Tools
- Drive Unit Meshing & Assembly Tools
- Inverter Meshing & Assembly Tools
- Vehicle body Meshing & Assembly Tools

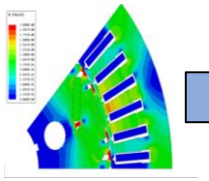


Input CAD → 2D planer Mesh full rotation

2D planer Mesh – Single Pole

Process Automations Facilitated by Customized Software features that integrates the model from one tool to other





Electro Magnetic Analysis

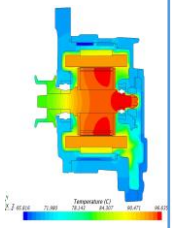
Inputs: Material Information
Winding Pattern
No. of Conductors

Outputs: Heat Loss of Motor Components

Design Optimization

CHT Analysis

Inputs: Heat Loss
Coolant BC
Contact Resistance

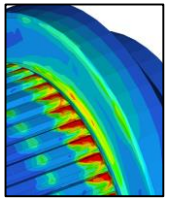


Outputs: Temperature of Motor components

Durability Analysis

Inputs: Temperature
Assembly Loads
Operating Loads

Meets Target



Outputs: Stress of Motor components

Final Design

Electrification processes & workflows

Sample Workflows: (Ready-to-use & Easily Integrated)

- Electro-Magnetism Analysis (EMA) of Electric Drive Unit
- CFD & CHT Analysis of Electric Drive Unit
- High Frequency Noise Analysis of Electric Drive Unit
- CFD & CHT Analysis of Inverter
- Vibration & Shock Analysis of Inverter
- Battery Cell level Electro-Chemical Analysis
- Battery Pack level CFD & CHT Analysis
- Vehicle Level Crash Analysis for Battery Pack
- System Modeling of Electric Vehicle
- Optimization to minimize Aero-drag
- Optimization to minimize Vehicle Weight

Email us: email@depusa.com | Visit our Website: www.depusa.com

USA: MI (HQ) : Detroit Engineered Products, 850 East Long Lake Road, Troy, MI 48085, USA. I Phone: +1-248-269 7130

INDIA : DEP India Pvt. Ltd., #2/86, 7th Avenue, Ashok Nagar, Chennai – 600 083, India I Phone: +91 44 42141453

BANGALORE : DEP India Pvt. Ltd., 4th Floor, Gamma Block, Sigma Soft Tech Park , HAL – Whitefield Main Rd , Bangalore 560066